

**General Guidance for Local Total Maximum Daily Load
Stormwater Wasteload Allocation
Watershed Implementation Plans**



DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard, Suite 540
Baltimore, Maryland 21230-1718

December 2021

I.	Purpose of this Guidance	2
II.	Legal Requirements	3
III.	Fundamentals	4
1.	Individual Semi-Annual Meetings	5
2.	General Structure and Principles	6
3.	Metrics	6
4.	Required Elements of all WIPs	8
IV.	Stakeholders	9
1.	Local Engagement	9
V.	Resource-based planning to improve and manage water quality	10
VI.	Illustrating Adaptive Management	11
VII.	Looking Forward to Attainment	12
VIII.	References	14

I. Purpose of this Guidance

Local jurisdictions with a National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Separate Storm Sewer System (MS4) permit are required to develop implementation plans that address all applicable Total Maximum Daily Load (TMDL) Stormwater Wasteload Allocations (SW-WLA). The purpose of this document is to provide guidance to the Phase I MS4s regarding the iterative management of SW-WLAs with respect to water quality standard (WQS) achievement at variable scales (e.g., TMDL watershed versus sub-watershed) and observed water quality improvements, as determined by the jurisdiction's comprehensive implementation planning process. This guidance contains checklists for required elements of a permit required SW-WLA implementation plan and makes recommendations regarding larger scale planning efforts intended to achieve overall TMDL goals. The overall goals of a TMDL are met when the assimilative capacity of a waterbody has been restored, water quality criterion have been met, and the waterbody/pollutant impairment combination have been removed from the 303(d) list. These same principles apply to SW-WLAs, either at the TMDL scale or smaller, subwatershed scales, depending on the nature of the watershed and TMDL. This document is the base framework for SW-WLA implementation plans, and will be complimented by impairment specific guidance documents.

This guidance is intended predominantly for Phase I (i.e., Large) NPDES MS4 Permittees: Anne Arundel County, Baltimore County, Baltimore City, Carroll County, Charles County, Frederick County, Harford County, Howard County, Montgomery County, Prince George's County, and the Maryland Department of Transportation State Highway Administration. Jurisdictions should use this guidance to assist in expanding planning efforts from primarily modeling TMDL pollutants to developing plans that adaptively implement Best Management Practices (BMPs) and address changing watershed conditions.

Phase I NPDES MS4 permit requirements dictate that jurisdictions implement efforts aimed at achieving TMDL SW-WLAs (see section below "Legal Requirements"). This guidance document is intended to enhance the jurisdictions' ability to iteratively, *and* adaptively, manage these implementation efforts under the current MS4 permit and subsequent permits well into the future. As jurisdictions with MS4 permits (and SW-WLA's) move beyond modeling scenarios and begin implementation of BMPs, the MS4 permit requirement to begin adaptively managing implementation will become the dominant process. This process should help to ensure return on investment from water quality improvement projects by collectively considering aquatic resources and all streams of water (e.g., stormwater, wastewater, drinking source water, irrigation source water, etc.).

Adaptive management as a technical process is flexible, but still requires a governing body to manage its water resources for objectives at multiple planning horizons and with heightened specificity. This means that aspects of water resource management, such as monitoring programs, actionable management triggers, data sources, and stakeholders are identified in

permit required implementation documents. Therefore, the governing entity needs to ensure that implementation plans function as mutual, shared protocols between all constituents of the planning and implementation process.

This document provides the basic framework for all subsequent impairment specific guidance documents. This overall framework is presented in Image 1 (see separate as of 12/08/2021 forthcoming document), which provides visual context for how the other impairment specific guidance documents relate to this, general guidance. The different guidance documents are at the top, with arrows pointing to resources and risks that have data generation activities associated with them. This information is fed into the chosen model or data processing methodology and an implementation plan is developed to achieve SW-WLAs and work toward ensuring the designated use of a waterbody is protected (i.e., the biological metrics are in good condition).

II. Legal Requirements

Legal requirements for Stormwater Wasteload Allocation (SW-WLA) Watershed Implementation Plans (WIPs) include five basic elements, which can be found in further detail in Part IV “Standard Conditions” of the jurisdiction’s [stormwater permit](#) (MDE 2020).

1. Date that the TMDL or individual allocation is planning on being met, with a detailed schedule of projects and programs leading to attainment.
2. Detailed accounting of cost estimates for projects and programs.
3. Detailed list of Best Management Practices (BMPs), programmatic initiatives, or alternative control practices to be implemented that have a solid scientific foundation for actions taken.
4. Specific adaptive management process that defines information feedback loops to evaluate implementation
 - a. This process is further described in this guidance document as well as associated pollutant specific guidance documents. Specifically, further details are provided regarding how to establish numeric goals (that can be reassessed and adjusted if needed), the development and incorporation of pollutant and resource monitoring plans, and the use of scientifically valid modeling to assist in planning efforts and progress tracking.
5. A system of public engagement for accountability purposes
 - a. Further details are provided in this guidance which includes how to use meaningful and technologically relevant forms of public engagement; including periodic and extensive reporting of monitoring modeling results and findings to the public. Information in the system should not be cumbersome to primary and secondary audiences.

Applicable permit language in support of the iterative and adaptive requirements for the SW-WLA Plans includes:

Part V.A.3

"Because this permit uses an iterative approach to implementation, the County must continuously evaluate the effectiveness of its programs and report any modifications in each annual report. Where programs are determined by the County to be ineffective, modifications shall be made within 12 months that effectively show progress toward meeting stormwater WLAs developed under EPA approved TMDLs."

Part V.B

"In order to assess the effectiveness of ___X___ County's NPDES stormwater program for reducing the discharge of pollutants to the MEP and working toward meeting water quality standards, the permittee will cooperate with the Department during the review of annual reports, field inspections, and periodic requests for additional data to determine permit compliance"

The referenced program effectiveness should be appropriate based on the latest science and available information. Consequently, in order for jurisdictions to assess the effectiveness of programs, they need to use up-to-date data and information. The regulatory oversight that MDE provides allows jurisdictions to inquire about appropriate information, in order for methodologies to be verified and validated. This means that SW-WLA implementation plans should be adaptive, updated once per permit term, and incorporate any and all new information that allows for a more accurate assessment of programs.

Once approved by MDE, the Restoration Plan is enforceable under the NPDES MS4 permit. A TMDL Restoration Plan is a technical planning-level document that identifies water quality-based strategies that a local jurisdiction may implement to control existing point and nonpoint pollutant sources in a degraded watershed. MDE allows flexibility in how local jurisdictions develop their TMDL Restoration Plans, provided that the approach is reasonable and that the Plan identifies management actions and practices that, when implemented, will restore the State water quality standards and designated uses of the impaired waterway.

III. Fundamentals

This document is general guidance that provides the framework for SW-WLA plan development. For specific information pertaining to individual pollutant SW-WLA plan development, jurisdictions should consult the pollutant specific IWPP guidance documents found here:

- [TMDL Stormwater Implementation Resources](#) (Updated documents forthcoming in 2021)

Information submitted to MDE IWPP, such as planned and implemented BMP acres/amounts, will be input into the MDE's Wasteload Allocation Tracker ("WLAT") database (e.g., the database that populates the "WLA" and "TMDL" Search functions on the [Maryland TMDL Data Center](#)) by MDE personnel. This will allow ease of information sharing between MDE IWPP and jurisdictions. MDE IWPP is assessing how data aggregated in the WLAT will be evaluated to demonstrate iterative water quality improvements and improve the State's understanding of water quality impairments and their drivers (MDE 2021). Jurisdictional technical, financial and other TMDL-related WIP needs should be communicated to MDE IWPP on a semi-annual basis so that support can be provided to the jurisdictions in the form of: (1) modeling, (2) monitoring design, (3) operations/field work, and (4) defining success beyond meeting legal requirements.

1. Individual Semi-Annual Meetings

MDE IWPP is recommending that all jurisdictions with a permit requirement to develop local TMDL SW-WLA implementation plans schedule meetings with IWPP to discuss any applicable issues related to the development of these plans and/or progress reporting. Many jurisdictions have already engaged with MDE IWPP on multiple occasions to discuss their plans. MDE IWPP would like to formalize this process in terms of scheduling. While biannual (2x per year) discussions are ideal, MDE IWPP does not want to burden jurisdictions with unnecessary meetings, if there are no issues to discuss. Therefore, these meetings can be scheduled at the discretion of the jurisdiction and MDE. Further, as long as open lines of communication exist between the State and the locals, these meetings may also not be required. When issues arise that are applicable to multiple jurisdictions, a joint meeting with all impacted jurisdictions should be held. If there are jurisdictions who are developing TMDL implementation plans without a permit requirement, MDE IWPP also recommends that these jurisdictions schedule semi-annual meetings to review the jurisdiction's WIPs.

These meetings will be held at a location that is most convenient for the jurisdictions; they can be virtual, at the jurisdiction, or hosted at MDE in Baltimore. These meetings are intended to provide consistent outreach and technical support to the jurisdictions with the legal responsibility to implement TMDLs. These meetings are also intended to limit superfluous and redundant written correspondence with the jurisdictions, in an effort to improve customer service and manage water quality more efficiently.

Lastly, MDE IWPP hopes that regularly scheduled meetings can help further develop the working relationship and capacity for professional collaboration between MDE IWPP and jurisdictional personnel. The intention of which is to create a mutually beneficial planning and implementation process so that local TMDL SW-WLA WIPs maintain their value over the long-term.

2. General Structure and Principles

WIPs developed by local jurisdictions need to be framed in a way so that those involved in the decision making process (in most instances the stakeholder base within the jurisdiction) feel comfortable and confident allowing the data and defined management triggers to decide the next step in the process. The plans should have a limited narrative. They should focus on explaining the path forward and backup options to meet SW-WLAs.

Many TMDLs within Phase I MS4 jurisdictions are driven by stressors from urban sources. In these instances, progress toward TMDL goals and the attainment of numeric water quality criterion are generally tied to implementation efforts in the urban sector, specifically urban stormwater. For other TMDL watersheds in MS4 jurisdictions that have multiple and different sources of impairment, general planning elements should still be applied. This should be done either at sub-watershed scales, where sources are more homogenous and addressed under the permit required implementation plans, or at the TMDL scale, where WQS achievement is dependent on far more than implementation in the urban stormwater sector. However, SW-WLA implementation in the urban sector at the TMDL scale should still lead to observed water quality improvements, but WQS achievement will likely not occur until all other sources of impairment are addressed. For jurisdictions conducting their planning using overall TMDL goals, the WIPs should work to align nonpoint source pollution planning elements (e.g., 319 Nonpoint Source Program, see “Federal Register / Vol. 68, No. 205 / Thursday, October 23, 2003 / Notices”) with Phase I MS4 permit requirements. This will allow jurisdictions to recognize the interaction of stressors caused by load allocations (LA) with wasteload allocations (WLA) and subsequently bring additional stakeholders into the watershed management process. While it is not required to use overall TMDL goals for planning purposes under the implementation plan requirement of the permit, MDE does encourage jurisdictions to work with their partners in other source loads to develop full scale watershed-wide implementation plans addressing all source sectors

MDE considers WIP development similar to a risk assessment. Jurisdictions should leverage data that has already been generated by State, County, local governments, and even private entities in order to evaluate risk from historical, current, or potential environmental impacts (see impairment specific guidance documents that outline required versus recommended datasets). Iterative management should be based on multivariate datasets that are developed and maintained based on [State of Maryland data submission standards](#) (MD iMap 2015).

3. Metrics

Modeling exercises are important because they provide a general framework for the implementation process to gauge interim progress, but overall implementation is gauged by monitoring progress toward water quality standards in a waterbody or watercourse (see [permit required monitoring guidelines](#), which is intended to provide the necessary framework for assessing real, observed progress). Jurisdictions should view these modeling efforts as a guide. For pollutant-specific modeling guidance please see the appropriate individual TMDL WIP

guidance document. Given the inherent complexity of ecological systems and the economic pressures on natural resources, these tools are continually being improved upon as new data is collected and research is conducted. Jurisdictions should not view impervious surface retrofits and restoration goals and TMDL attainment and/or attainment of WQSs as interchangeable. Jurisdictions should avoid using impervious surfaces and impervious surface retrofits as the only indicator of improved watershed health (see permit required monitoring). Jurisdictions should also consider using pollutant specific indicators as well as surrogates and corollaries (e.g., impervious surface treatment, turbidity measurements, etc. for nutrients and sediments), which will be discussed further in impairment specific guidance documents and associated materials. Sediment and nutrient wasteload allocations need to have models, however, for impairments such as PCBs and Bacteria, MDE is not requiring that modeling be performed for any purposes, e.g., baseline assessments or for assessing progress. There is significantly greater uncertainty surrounding estimated load reductions and source contributions with these impairments, compared to more traditional pollutants (for which MDE is requiring jurisdictions to model baseline, current progress, and planned load reductions).

Following SW-WLA WIP development and multiple years of interim progress assessment, jurisdictions should evaluate their existing work with an eye toward the technical concepts of adaptive management as described below. It is imperative, with each interim progress assessment and adaptive management evaluation, that jurisdictions explicitly record decision making rationales in their WIPs, and not in separate documents. This ensures continuity in bureaucratic administration regardless of personnel-changes. This also ensures that decision making takes into account past successes and failures. At every chance, jurisdictions should consider how the plan works to preserve institutional knowledge and data.

The WIPs should be specific and precise in documenting the decision making process. If a WIP is not specific, then it is likely general and vague in its intent and if this is done intentionally, WIPs still need to state why the language is general and vague. Information presented in the WIPs should be immediately useful to the jurisdiction. Use simple approaches and basic questions to generate information: who, what, where, when, why, how?

4. Required Elements of all Watershed Implementation Plans

The following are the required elements of any SW-WLA WIP. Primary elements 1-7 are required. Sub-elements are recommendations only and are provided as examples, except where noted.

1. What is being adaptively managed, e.g., a resource, a pollutant, a program, and/or individual implementation projects? For SW-WLA plans, this will be the pollutant¹.
2. Why is adaptive management being used?
 - a. Is there an aspect of the water resource management process that is specialized?
 - b. Does the jurisdiction expect to have to modify the project or program as a result of an issue?
3. What are the stepwise goals and objectives that consider both jurisdictional resources and the goals and objectives of the SW-WLA and TMDL? What are the costs associated with proposed management strategies?
 - a. What is the budget?
 - b. Who has responsibility?
 - c. Who is legally liable?
4. Who is the primary audience of the plan and why?
5. What information is available and how is that information used to inform WIP development?
 - a. Is information from permit required watershed assessments being addressed in detail by section in the TMDL implementation plan?
 - b. Have other documents/studies been published that contribute to understanding the watershed as a multi-faceted system and the natural resources it supports?
 - c. Do other watershed plans exist in the watershed; either generated by a government, utility, or non-governmental entity? Provide this information and details about other monitoring programs, so data can be shared on a regularly scheduled basis.
 - d. Has the jurisdiction modeled pollutant sources and expected load reductions from potential, planned actions, where applicable?
 - e. Is monitoring data being used to inform actions?
6. How does the watershed function for the public in terms of its beneficial uses (beneficial uses will vary based on the pollutant in question)?

¹ Other examples of adaptively managed endpoints are provided for reference. However, plans should tie management of the pollutant in question back to the resource that is being protected, and resource priorities should be used in planning efforts. For instance, fecal bacteria water quality criteria are intended to protect the water contact recreation designated use of all waterbodies. Therefore, designated beaches and areas where the public frequently come in contact with the applicable waterbody should be used to prioritize management actions.

- a. How are stakeholders considered in the planning document (Required Element - see “Stakeholders” section below for further details)?
 - b. What are the watershed resource concerns of the jurisdiction’s constituents?
 - c. Have they been enumerated in the WIP?
 - d. What conflicts exist or can be foreseen?
7. What are the proposed planning horizons and how will they be justified?
- a. Identify indicators and determine if they are currently meeting goals.
 - i. How will goals and progress toward goals be achieved;
 - ii. and endure alongside economic development and population growth.
 - b. Is the proposed planning horizon the point at which improvement is expected?
 - c. Or is the planning horizon simply based on model accounting?
 - d. For example: why is the milestone goal expected from the process at this point in time, e.g., why does a jurisdiction expect to see average watershed embeddedness scores decrease by 5% within the next 5 years?
 - e. Who does what if milestones for horizons are not met on time?

IV. Stakeholders

1. Local Engagement

Local engagement models can be diverse. Broadly speaking two approaches will likely prove useful for jurisdictions. (1) Consensus building among stakeholders using a facilitator, and (2) a decision making process driven by established data standards and managed by appropriate personnel, where anyone can contribute information for making decisions as long as it meets those standards. These are recommendations that should ideally improve the implementation process, and should not needlessly add to administrative burdens. Both approaches should develop a series of contacts that are formalized within the County to disperse TMDL information. These contacts should include: specific jobs/positions within the jurisdiction that should be receiving TMDL emails from MDE IWPP or internal updates from the jurisdiction, other programs at MDE with whom the jurisdictions collaborate and communicates, natural resource agencies, local watershed groups, key community influencers, citizens advisory committees, leaders from community (see Section IV.F.4 for specific permit requirements regarding SW-WLA implementation plan local engagement). In addition, jurisdictions should develop a list of entities and individuals who collect, store or manage water resource data and data on risks (e.g., sources of a given pollutant) associated with the quality of water resources. Jurisdictions should be considering these entities not only from a programmatic standpoint, but critically consider the information pathways. For instance, it is recommended that jurisdictions include a data solicitation process in their WIPs.

Through the process of building a collaborative WIP, jurisdictions will be able to better consider merging plans based on watershed boundaries rather than managing their water resources based on political boundaries. Joint planning efforts will: eliminate redundancy, save money and shorten attainment times by coordinating implementation efforts, and promote longevity of planning and implementation actions.

V. Resource-based Planning to Improve and Manage Water Quality

Resource based management can increase the efficiency of planning efforts while maintaining predetermined legal obligations on individual jurisdictions. Examples of natural resources with both social and economic benefits to plan toward are explicitly detailed in [Maryland's designated uses](#): water contact recreation, water supply, shellfish harvesting, and beaches. Other resources that are of importance to the cultural heritage or local economy of jurisdictions should also be considered such as: [Maryland's High Quality Waters \(Tier II\)](#) and [Maryland Scenic and Wild Rivers System](#).

A well-developed plan should include a section linking the designated uses in the watershed and the permit driven restoration work to address the applicable TMDL pollutant being performed. This will enable the plan to guide pollutant reduction management strategies based on resource integrity. Timeframes for implementation should be laid out based on: (1) funding/project milestones (e.g., plant 50 acres of riparian buffer in specified locations), (2) physical, chemical, and biological uplift, and eventually (3) final attainment of WQSs (Harman et al 2012).

Furthermore, in certain cases it is recommended that jurisdictions break down watersheds into manageable components by planning at the subwatershed scale. This will improve the resolution of resources that are intact versus impaired. It will also lead to better decision making. Jurisdictions should use questions such as the following to frame the plan at every juncture specific to the water resources in question, as generally discussed earlier in this guidance, (who, what, where, when, why, how?):

- What natural resource assets are being prioritized?
- What resource vulnerabilities are being prioritized?
- What BMPs are you using and why?
- What is the timeframe for on the ground work?
- How will progress be tracked?

In addition, jurisdictions should review the literature specific to the resource and pollutant(s) in the Chesapeake Region to inform their planning efforts. This information can be found in a variety of public information clearinghouses and publications. An example of one of these

clearinghouses is the Chesapeake Bay Trust's Restoration Research initiative:
<https://cbtrust.org/grants/git/git-projects/>

VI. Illustrating Adaptive Management

Adaptive management is a methodology that supports and informs the continual evolution and revision of a WIP document. In particular, adaptive management includes monitoring the impacts of restoration, assessing whether outlined goals/milestones have been met and whether or not new specified management actions should be taken. These decisions are made based on predefined and purposeful management triggers. Therefore, a monitoring plan for the purposes of identifying pollutant sources across the landscape, refining watershed models, and tracking progress at variable scales and for different purposes, e.g., overall progress towards within a watershed or sub-watershed, assessing site scale BMP effectiveness, etc., is a part of, but not solely adaptive management in and of itself. So, for individual projects and programmatic initiatives, it might be necessary to utilize metrics that are not directly tied to water quality monitoring plans.

A definite part of the jurisdictional adaptive management process is tracking revisions to the plan and the details of those revisions. This should include an internal process outline in the WIP of how comment-and-response between the jurisdiction and MDE IWPP is being tracked between reporting periods.

Quick Take: Modeling

Question: Is all adaptive management predicated on empirical data collection and not on any watershed modeling results?

Answer: The model is a prediction tool, but adjustment to management strategies should be based on actual observations. Maryland takes the same approach for Chesapeake Bay Restoration. The State uses the model to predict what the impacts of management strategies will be on loads and assess progress towards load reduction goals. However, Maryland does not assess the effectiveness of those management strategies using the model.

Four primary components of an adaptive plan include:

1. Specifying and describing what monitoring method(s) is/are being used.
2. Listing and describing what quantitative management triggers are being established.
3. Indicating what the timeframe for decision making is.
4. Documenting what the potential management actions and options are.

In order to manage this flow of information a decision matrix or flowchart to visualize historic and future watershed management is recommended. This will enable the jurisdiction to describe efficiently how monitoring data is specifically feeding back into the adaptive management framework that the WIP establishes.

Jurisdictional WIPs should be forward thinking in terms of unexpected future scenarios. Example questions jurisdictions should be asking themselves to plan for these unexpected scenarios include:

1. What happens if the monitoring data show something unexpected?
2. What happens if engineering fails or produces other problems (e.g., insect growth in stormwater ponds)?

The following represent potential confounding issues that could arise during WIP development:

1. Permit requirements are different from management triggers and actions.
 - a. Both need to be addressed.
 - b. Both are not always interrelated.
 - c. This may require two simultaneous paths forward within the same plan; one to ensure legal requirements are satisfied and another to address complex issues outside the boundary of permit requirements.
2. Some components that are adaptively managed may result in no action.

VII. Looking Forward to Attainment

Attainment can be defined via two primary means: 1) documented achievement of WLAs via implemented practices and modeling exercises, and 2) documented achievement of water quality criteria consistent with MDE published assessment methodologies. When a jurisdiction demonstrates via modeling exercises that they have achieved their wasteload allocation, an attainment plan, which incorporates a monitoring component consistent with MDE's designated use and water quality criteria assessment methodologies, should be developed. For instance, for nutrient and sediment impairments, monitoring plans should be developed to feed into MDE's BSID and biological assessment methodologies. The BSID estimates the likelihood that an aquatic life impairment (as defined by benthic index of biotic integrity (BIBI) and fish index if

biotic integrity (FIBI) scores) is caused by a specific type of stressor. Stressor prevention, abatement, and elimination are the keys to successful attainment. Further details are provided in MDE's attainment plan guidance and "Delisting Methodology for Biological Assessments", which can be found on MDE's website at:

https://mde.maryland.gov/programs/Water/TMDL/Integrated303dReports/Pages/ir_listing_methodologies.aspx.

When jurisdictions have demonstrated achievement of water quality criteria, the narrative changes again, and Attainment Plans shall shift their focus on ensuring that criteria continue to be achieved into the future. As noted previously, further details are specified in MDE's attainment plan guidance, which can be found at

<https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/TMDLStormwaterImplementation.aspx>

VIII. References

- Andrews, Mary, and McLain, Serena. 2019. *Adaptive Management Plan for Bloede Dam Impoundment, Patapsco River, Maryland*. NOAA Fisheries. May 1, 2019.
- Charles County. 2018. *Zekiah Swamp Watershed Assessment*. Prepared by KCI Technologies. Feb. 2018.
- Deep Creek Watershed Plan Steering Committee. 2016. *Deep Creek Watershed Management Plan*. Deep Creek Watershed Plan Steering Committee for the Garrett County Board of County Commissioners and Maryland Department of Natural Resources. Mar 7, 2016.
- Frost, William, Craig Lott, Rosanna LaPlante, and Fred Rose. 2019. *Modeling for TMDL Implementation*. J. Hyrdol. Eng. 24(6): 05019010.
- Harman, W., R. Starr, M. Carter, K. Tweedy, M. Clemmons, K. Suggs, C. Miller. 2012. A Function-Based Framework for Stream Assessment and Restoration Projects. US Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds, Washington, DC. EPA 843-K-12-006 https://www.epa.gov/sites/production/files/2015-08/documents/a_function_based_framework_for_stream_assessment_3.pdf
- Maryland iMap. 2015. *MD iMAP Data Submission Policy Version 2.0*. March 2015. <https://imap.maryland.gov/Documents/Data/MDiMAPDataSubmissionPolicy.pdf>
- Maryland Department of the Environment (MDE). 2021. <https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/TMDLStormwaterImplementation.aspx>
- MDE. 2021 National Pollution Discharge Elimination System (NPDES) (MS4) Permits 2021 MS4 Monitoring Guidelines: BMP Effectiveness and Watershed Assessments, Oct 2021 <https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/Final%20Determination%20Dox%20N5%202021/2021%20MS4%20Monitoring%20Guideline%20Final%2011%2005%202021.pdf>
- MDE. 2021. *Maryland TMDL Data Center*. <https://mde.maryland.gov/programs/Water/TMDL/DataCenter/Pages/index.aspx>

MDE. 2021. *Biological Stressor Identification Studies*.

https://mde.maryland.gov/programs/Water/TMDL/Pages/bsid_studies.aspx#:~:text=MDE%20has%20developed%20a%20Biological,biological%20conditions%20in%20impaired%20watersheds.

MDE. 2020. *Maryland's Designated Uses/Use Class Map*.

<https://mde.maryland.gov/programs/Water/TMDL/WaterQualityStandards/Pages/DesignatedUsesMaps.aspx>

MDE. 2020. *Maryland's NPDES Municipal Separate Storm Sewer System (MS4) Permits*.

https://mde.maryland.gov/programs/Water/StormwaterManagementProgram/Pages/storm_gen_permit.aspx

MDE. 2020. *Maryland's High Quality Waters (Tier II)*.

https://mde.maryland.gov/programs/water/tmdl/waterqualitystandards/pages/antidegradation_policy.aspx

MDE. 2016. *Maryland's Priority Listings*. TMDL Technical Development Program. Baltimore, MD. 2016.

MDE. 2014. *General Guidance for Developing a Stormwater Wasteload Allocation (SW-WLA) Implementation Plan*.

Baltimore, MD Oct 2014.

MD iMap. 2015. MD iMAP Data Submission Policy Version 2.0. March 2015.

<https://imap.maryland.gov/Documents/Data/MDiMAPDataSubmissionPolicy.pdf>

Maryland Department of Natural Resources (MDNR). 2020. *Maryland Scenic and Wild Rivers System*.

<https://dnr.maryland.gov/land/pages/stewardship/scenic-and-wild-rivers.aspx>

MDNR. 2015. *Maryland State Wildlife Action Plan 2015-2025: Chapter 8 Monitoring and Effectiveness Measures*.

Maryland State Highway Administration. 2017. *Prospectus Bloede Dam Mitigation Bank*. Baltimore, MD. Apr 7, 2017.

Maryland Sea Grant. 2020. <https://www.mdsg.umd.edu/topics/watershed-restoration/watershed-restoration-specialists>

National Oceanic Atmospheric Administration (NOAA). 2018. *Envision the Choptank Common Agenda*.

United States Army Corp of Engineers. 2004. *Adaptive Management for Water Resources Project Planning*.

United States Environmental Protection Agency. 2018. *Critical Source Area Identification and BMP Selection*.

Supplement to Watershed Planning Handbook. United States Environmental Protection Agency Office of Water Nonpoint Source Management Branch. Washington, DC 20460. EPA 841-K-18-001. July 2018.

Virginia Department of Environmental Quality. 2017. Guidance Manual for Total Maximum Daily Load and

Implementation Plans. Richmond, VA. June 2017.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. Adaptive Management: The U.S. Department of the Interior

Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.